hours that followed. The bite of a scolopendrid is painful to adult humans, and can be fatal to infants (Khanna 2009).

With the exception of the Long-nose Snake (Easterla 1975) the centipede was always longer than its prey and may have outweighed it as well (Carpenter and Gillingham 1984). In this case, though the centipede seemed heavier, the snake was clearly longer, but this did not seem to increase the odds of its survival; strangely enough, all through its ordeal, the snake made no attempts to bite back at the centipede.

Do scolopendrids regularly feed on snakes or was this a display of opportunistic behaviour, and hence a rare event? And to what limit does this fierce centipede go to get a meal, e.g., does it feed on other larger/venomous snake species as well? These are a few questions which when answered could lead to a whole new understanding of little known trophic links, e.g., arthropods preying on vertebrates, the complexity and significance of which probably has not been evaluated enough.

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15. ARCHITECTURE OF ABUTTING SURFACES OF THE SHELLS OF ACORN BARNACLES

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Introduction

In recent years, several reports on the structure and architecture of the shells of acorn barnacles (Cirripedia, Crustacea) have been published (Karande and Palekar 1963; Klepal and Barnes 1975; Murdock and Currey 1978; Otway and Anderson 1985; Bourget 1997). By and large these reports deal with the adhesive and compressive strengths of various species settled on a variety of natural marine substrates and on man-made structures (Costlow 1956).

In the macrostructure study of barnacles, some of the shell structures considered are radial margins of parietes, alar margins of parietes, parietal canals, radial canals in basal plate, parietal sheath and interlamellar primary and secondary septae (Bourget 1997). All these structures which contribute to the strength of the shells are in the forms of ridges, teeth or lamellar ribs, and are sculptured more or less elaborately in different cirripede species. In the present study, abutting sculpturings of ten Indian species and eleven species endemic to the American coast were examined.

In this study, individual adult barnacles of various dimensions were used. The local barnacles examined were *Euraphia withersi* (Pilsbry), *Chthamalus malayensis* (Pilsbry), *Chirona amaryllis* (Broch), *Balanus amphitrite* (Darwin), *B. variegatus* (Darwin), *B. kodakovi* (Tarasov and Zevina), *Megabalanus tintinnabulum* (Linnaeus), *Tetraclita purpurascens* (Wood) and *Tetraclitella karandei* (Ross).

It also became possible to examine macrostructures of acorn barnacles sent to us by Dr. Arnold Ross of the American Museum of Natural History, San Diego. These species collected along the US coast were *Chthamalus dalli* (Pilsbury), *Chthamalus fissus* (Darwin), *Balanus (Semibalanus) cariosus* (Pallas), *B. crenatus* (Bruguiere), *B. glandula* (Darwin), *B. balanus* (Linnaeus), *B. rostratus* (Hock), *Tetraclita squamosa rubescens* (Darwin),

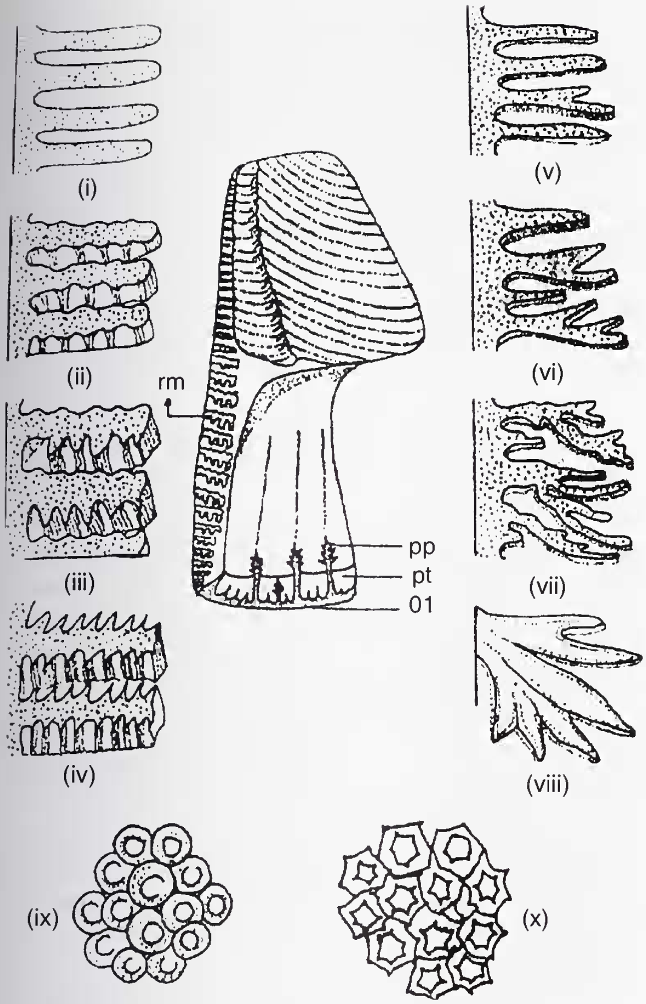

Fig. 1: Acorn barnacle parietal plate (semidiagrammatic); types of sculpturings on radial margin (rm); stripe (i to iv); lamellar (v to viii); dish-shape (ix to x); pp, pt, o1 (see Fig. 2)

T. rubescens elegans (Darwin), *T. stalactifera* (Lamark) and *Megabalanus tintinnabulum californicus* (Pilsbry).

All tropical species, except *Balanus kondakovi*, are collected at Mumbai. Of the US species, *B. crenatus*, *B. rostratus* and *T. stalactifera* are collected at Friday Harbour, Alaska and Puetro Refugio respectively. The rest of the species are collected from the Californian coast.

The nomenclature used for description of various shell components is the same as given by Bourget (1997). The semi-diagramatic illustrations of the shell components are given in Figs 1 and 2.

Radial margin of parietes: The radial margin which abuts against margin of an adjoining plate is variously sculptured in different species. In its simplest form as is seen in *E. withersi*, it shows parallely placed stripes that provide anchoring surface for the parietal plates (Fig. 1i). In *Chirona amaryllis* each of such stripes is moderately built and has a series of smooth teeth (Fig 1ii). In the three tropical balanids,

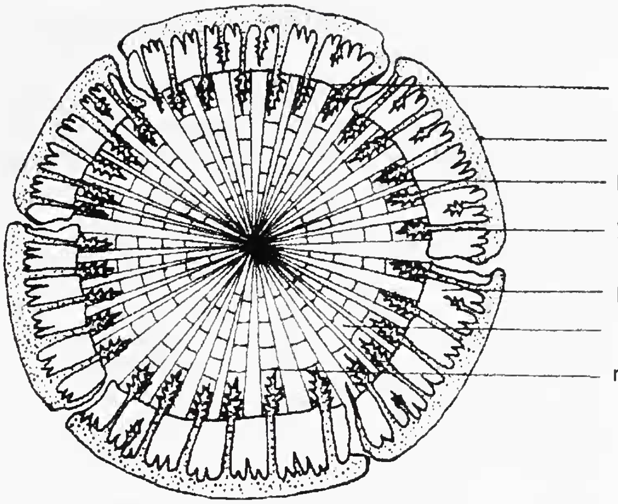

Fig. 2: Acorn barnacle shell (semidiagrammatic); a cross section of shell at the junction of the parietal plates and the basal plate; il: inner lamina; ol: outer lamina; pp: pinnate process; ps: parietal septum; pt: parietal tube; rc: radial canal; rcs: radial septum

namely, *Balanus amphitrite*, *B. variegatus* and *B. kondakovi*, each of the simple stripes becomes pectinated (Fig. 1iii). A pectinated surface is also noted in a recently collected balanid from Karwar coast, which is identified as *B. reticulates*. In *M. tintinnabulum* each stripe shows bipinnate pattern. Here each tooth is a sharp and pointed structure unlike rounded ones observed in balanids (Fig. 1iv).

In species like *B. glandula*, *B. crenatus* and *B. balanus*, all from the American coast, the sculpturing begins to lose its well-defined pectinated pattern observed in tropical balanids. The pectinated stripes assume lamellar forms which in turn branch and rebranch into ribbon-like or a water-spill like processes (Fig. 1v, vi, vii). An elaborately developed lamellar anchoring surface is thus observed in *B. rostratus* where pectinated pattern is completely lost (Fig. 1viii). It is, however, amply clear that this pattern has its origin in the basic stripe like geometric design.

In *C. malayensis*, an orderly arrangement of anchoring design is completely lost though there is some evidence of serially arranged stripes on the radial margin. The surface has irregularly placed short, round pits which interface with the elevations present on the adjoining plates. Here, generally the surface can be described as rough and devoid of any definite pattern (Fig. 1ix). In the temperate species *Chthamalus fissus* and *Ch. dalli*, unlike *Ch. malayensis*, an organized pattern of stripes is retained. These stripes, however, are not well demarcated from one another.

In tetraclitellan *Tetraclitella karandei* an anchoring pattern is distinctive. Here the abutting surface is not a solid plate. The surface is traversed by randomly placed holes, which in reality are the openings of the parietal canals. These openings have flanged-like margins (Fig. 1x), which anchor on corresponding depressions on adjoining parietal plates.

In *T. purpurascens*, an anchoring surface is restricted to a very narrow area along the length of radial margin. Here the sculpturing is in the form of one row of deep pits. However, in both the Californian species, namely *Tetraclita squamosa rubescens* and *Tetraclita stalactifera*, the anchoring surfaces, unlike that of *Tetraclita purpurascens*, are elaborately lamellar as is also seen in some balanids. In *Tetraclita squamosa rubescens* particularly, the lamellar processes are heavily built.

Table 1 gives types of sculptural patterns of radial margins of parietes of the tropical and the temperate barnacle species.

Parietal canals: In *E. withersi*, *Chirona amaryllis* and in two chthamalids, the parietes are solid plates. In all the balanid species examined here, the plates are traversed by a single row of canals (Fig. 2). In *T. squamosa rubescens*, *T. stalactifera*, *T. purpurascens* and *T. karandei* parietes have several rows of canals. It is notable that *B.* (*semi*) *cariosus* of the family Archaebalanide shows several canals. These canals, however, are differently organized and are not homologous with those of balanids (Prof. William Newman pers. comm.).

Basal plate radial canals: The radial canals (Fig. 2rc) are present in all solid base species of chironid, balanid and megabalanid. These canals are, however, absent in temperate species, namely *B. balanus* and *B. crenatus*.

Interlamellar septae: The interlamellar septae emerging from the outer laminae of parietes (Fig. 2ol) terminate into wedge-shaped pinnate processes (Fig. 2pp). These help to strengthen the joints between the parietes and the base of a shell. Two types of wedge-shaped pinnate processes are reorganized. The more heavily built septal processes rest in the hollows of the radial canals located around the periphery of the basal plate. It is noted that in temperate balanids in *B. balanus* and *B. rostratus*, the secondary septal processes, unlike in tropical balanids, emerge from the inner walls of the parietes.

The sculpturings of radial margins of the parietes of the shell in acorn barnacles can be broadly divided into three patterns. The first pattern shows a series of simple stripes placed parallely to one another along the length of the margin. Each of these stripes may further assume a pectinated form. In the second pattern, the stripe may branch and rebranch to create an elaborate lamellar network. In a further modification, a lamellar form assumes moderately built sheet-like surface. The third pattern of sculpturing is notably different from the first two patterns. Here the abutting surface shows several interfacing shallow pits and domes, a stripe-like geometric pattern being totally absent.

A pattern of stripes, simple or pectinated, seems to be a basic form of abutting surface. A majority of the tropical

Table 1: Acorn barnacles; sculpturing patterns of radial margins of shell pariete of tropical and temperate species

Cirripede species	Radial margin sculpturing (see Fig. 1)									
	Stripe				Lamellar				Flanged-dish	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Tropical										
Euraphia withersi	+									
Chthamalus malayensis									+	
Chirona amaryllis		+								
Balanus amphitrite			+							
Balanus variegatus			+							
Magabalanus tintinnabulum				+						
Tetraclita purpurascens										+
Tetraclita sp.	+									
Tetraclitella karandei										+
Temperate										
Chthamalus dalli	+									
Chthamalus fissus	+									
Balanus (*semibalanus*) *cariosus*							+			
Balanus balanus						+				
Balanus crenatus					+					
Balanus glandula					+					
Balanus rostratus							+			
Megabalanus tintinnabulum californicus				+						
Tetraclita squamosa rubescens							+			
Tetraclita rubescens elegans							+			
Tetraclita stalactifera								+		

barnacles, including *E. withersi* as well as balanids show this simple striped pattern. In balanids, particularly, a simple stripe may assume pectinated form and in megabalanid it may become multi-pectinated.

In tropical balanids like *B. amphitrite*, *B. kondakovi* and *B. variegates* the abutting surfaces show a series of pectinated stripes, whereas in temperate balanids, it shows an elaborately sculptured lamellar pattern. In tropical chthamalid *C. malayensis*, the parietes show pits and domes on the abutting surfaces. The temperate chthamalids on the other hand show simple stripes. Differing sculptural patterns are also observed amongst tetraclitilid species. The two tropical species, namely *Tetraclita purpurascens* and *Tetraclitella karandei* show pits and dome type of sculpturing whereas one *Tetraclita* sp., possibly an Indo-Pacific species, collected at Port Blair, (Andaman) shows simple stripped pattern. Each of the three temperate tetraclitilids, namely, *Tetraclita squamosa rubescens*, *T. rubescens elegence* and *T. stalactifera* shows lamellar pattern of sculpturing. Thus, amongst the members of each of three genera, namely balanids, chthamalids and tetraclitilids, separated from each other geographically, distinct variations in abutting surfaces are observed.

One observation that stands out boldly is that, as a rule, none of the tropical species examined show a lamellar pattern of abutting surface (Fig. 1 v to viii). On the other hand, among the American species, belonging to the three widely separated genera, the most prevalent sculpturing pattern is the lamellar one. Even *B.* (*semi*) *cariosus*, an archaebalanid, displays a lamellar pattern.

The differences in sculpturings observed even amongst the members of a single genus, as well as between the tropical and the temperate species, do not seem to have resulted because of varying ecological conditions. What little orderliness in abutting surfaces complexity is observed, suggests that this surface is not an unstable or a transient character. It is, therefore, unlikely to be influenced by varying ecological conditions. A total absence of a lamellar pattern in tropical barnacles, after all, cannot be due to any ecological factor. Furthermore, varying ecological conditions can prevail even within a restricted geographical area, and this situation can lead to alteration of surfaces even among individual members of a single species, as is evident in the opercular valves of *Chthamalus malayensis* (Karande and Palekar 1963). However, no such differences in the abutting surfaces of parietes of individuals of different sizes inhabiting varying environments are noticeable.

The tropical acorn barnacles: *Euraphia*, *Megabalanus* and *Balanus* show, in that order, an increasing elaboration of stripe pattern of the sculpturing (Table 1, Fig. 1). The temperate species of *Chthamalaus*, *Megabalanus* and *Balanus* also show an increasing complexity of this surface. It would, therefore, be worthwhile to investigate, using a larger representative species, if there exists any relation between this shell character and the cirripede phylogeny as suggested by Prof. William Newman (pers. comm.). The present authors found themselves ill-equipped to examine the likelihood of such relation. Hence this note.

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16. *ANDRACHNE TELEPHIOIDES* L. (PHYLLANTHACEAE) – AN ADDITION TO THE FLORA OF PENINSULAR INDIA

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Introduction

Andrachne telephioides L. is distributed in India, Pakistan, Afghanistan, and westwards along Mediterranean areas to Spain. In India, this sole representative of the